AI LÖSNINGAR FÖR INDUSTRIELL TILLÄMPNING

Mark Hammarstedt 2020-06-09

KONTAKT:

MHAMMARSTEDT@NVIDIA.COM |
+46 (0)730 980587 MOBILE

FWALL@NVIDIA.COM
+46 (768) 591696

AGENDA

Evolving trends in Manufacturing and Industrial

Role of AI and accelerated computing

- Common use cases and solution platforms

Going deeper on two key use cases

- Manufacturing inspection

- Predictive maintenance

NVIDIA Advantage

- Record breaking performance

- Product platform

- Next steps

NVIDIA — A COMPUTING PLATFORM COMPANY

NVIDIA pioneered accelerated computing to solve problems that normal computers cannot solve. The approach is broadly recognized as the way to advance computing as Moore's law ends and AI lifts off. NVIDIA's platform is installed in several hundred million computers, is available in every cloud and from every server maker, powers 136 of the TOP500 supercomputers, and boasts 1.6 million developers.
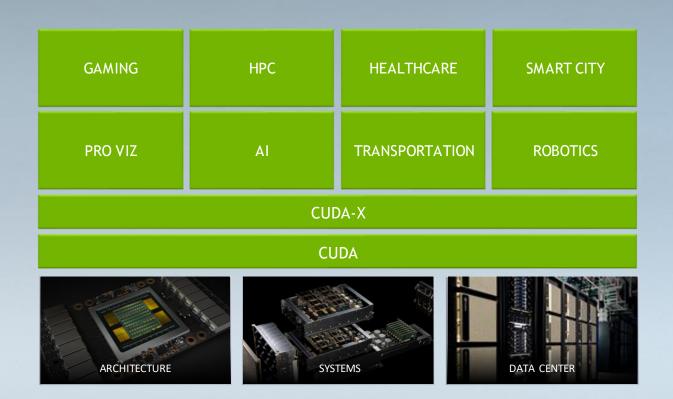
ACCELERATED COMPUTING — MUCH MORE THAN A CHIP

Accelerated computing uses the right tool for the right job — two processors: one great for sequential single-threaded processing; one great at parallel multi-threaded processing.

It demands deep integration – from the processor and systems and data centers, to the algorithms and applications that run on top of them.

Nearly 15 years in the market, NVIDIA CUDA is the de facto standard architecture for accelerated computing.

In addition, we've developed software that optimizes our platform for the large markets we serve, from gaming to transportation to healthcare.

GAMING	HPC	HEALTHCARE	SMART CITY
PRO VIZ	AI	TRANSPORTATION	ROBOTICS

CUDA-X

CUDA

ARCHITECTURE

SYSTEMS

DATA CENTER

ONE PLATFORM, FOUR ENGINES

Industries from transportation to healthcare and financial services to retail are racing to leverage the automation power of AI. As they do, AI is moving from the cloud to the edge, and into autonomous devices. NVIDIA is creating a platform for each step.

DGX
A 100

HGX
for Hyperscale Cloud

EGX
for Edge AI

AGX
for Autonomous Systems

POWERING AI
AT THE EDGE

AI is spilling out of the cloud and into the edge where oceans of raw data is generated by the world's largest industries. On factory floors.
In stores. On city streets. In urgent care facilities.

The NVIDIA EGX platform puts AI performance closer to the data to drive real-time decisions when and where they're needed most.
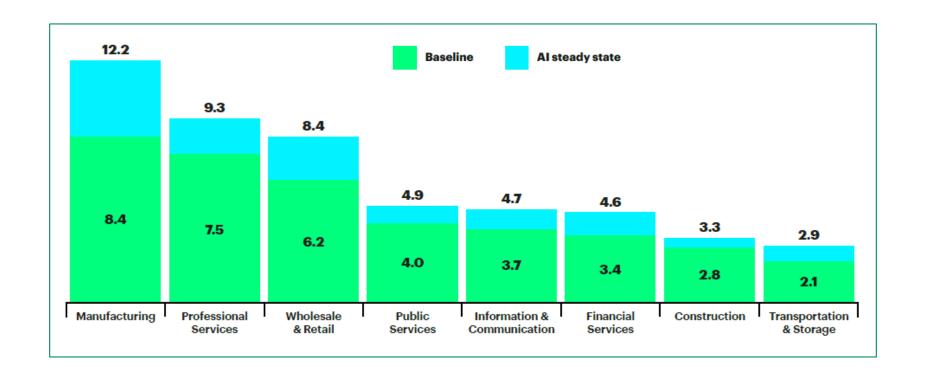
EVOLVING TRENDS IN MANUFACTURING AND INDUSTRIAL

AI IMPACT FOR INDUSTRIALS

$4.8+ trillion added economic value for Industrials*

Source: Accenture & Frontier Economics: How AI Boosts Industry Profits and Innovation
* Includes Manufacturing, Transportation & Storage, and Utilities

MACRO TRENDS

Manufacturing & Industrial

	Workforce	Data Availability	Quality	Equipment Utilization	Advanced Manufacturing	Customization	Supply Chain & Logistics
Trends	Aging Workforce Training Process automation	Proliferation of sensors	Rising customer expectations Distributed manufacturing scale	Condition-based asset management	Precision fabrication technologies Additive manufacturing	Smaller production lots Localized product requirements Growth of intl. markets	Complex dynamic international supplier networks Lean inventory Automated material handling
Impacts	Boost workforce productivity	Fuel for AI and data-driven models	Maximize return on capital Increase throughput Minimize scrap/rework	Maximize return on capital Maximize uptime	Differentiated product capabilities	Reduce time to market	

MANUFACTURING & INDUSTRIAL AI USE CASES

MANUFACTURING INSPECTION	PREDICTIVE MAINTENANCE	INTELLIGENT VIDEO ANALYTICS (IVA)	SUPPLY CHAIN & LOGISTICS	CONVERSATIONAL AI / NLP
Quality Inspection & Test	Monitoring and Diagnostics	Field Inspection	Supply/Demand Forecasting	Operational Process Automation
Yield and Throughput	Uptime	Health & Environmental Safety	Scheduling & Route Optimization	Work Scope Optimization

MANUFACTURING INSPECTION OVERVIEW
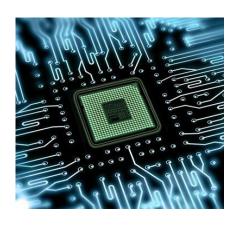
AI Augmented Inspection Processes

What

- AI-enabled vision systems to dramatically improve and automate quality inspection processes.

Why

- Increased yield: increased efficiency and production throughput while reducing scrap

- Consistent quality: repeatably high accuracy across varying conditions

- Fewer test escapes (false negatives): Less downstream wasted cost of production & materials through improved test sensitivity

- Reduce false positives: decrease unnecessary manual re-inspection through improved test specificity

NVIDIA.

MANUFACTURING INSPECTION BUSINESS VALUE

Semiconductor

1% in incremental yield adds $60 M in annual profit

Electronics

64% reduction in test escape, resulting in 1.5%+ yield increase through better capacity utilization

Component

Doubled throughout from 20-30 seconds to less than 9 seconds for defects as small as 50 μm

Assembly & Cosmetic

Each line averages 1 test escape per day. Reducing defect escapes, saves $50,000 per line per day

NVIDIA.

COMPLEX TEDIOUS INSPECTION MADE EASY

Converting complex, manual, repetitive and stressful inspection tasks creates a better work environment while delivering quick, accurate and reliable results. Optical inspection is 20% of the manufacturing workflow and 30% of the manufacturing costs.

A automotive gear supplier is deploying AI-powered optical inspection systems with NVIDIA TX2 and trained with NVIDIA DGX to **deliver 99% accurate inspection of 1mm defects on gears and 0.5mm defects on welding.**

https://www.youtube.com/watch?v=8AVVKb42s5c#action=share

MFG INSPECTION - GTM ECOSYSTEM

Service Providers

SFL SCIENTIFIC DISCOVER MORE | SPYGLASS | DATA Monster | VICOMM 有利康科技股份有限公司 | QUEST BORN TO ENGINEER
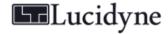
Turnkey Solution Providers

nanotronics | Lucidyne | MUSASHi

ISV Partners

NURL AI | razorlabs | COGNEX VIDi | MVTec Software GmbH | SAIGE-RESEARCH | SMA SOFT | ABEJA | RUDOLPH TECHNOLOGIES | LANDING AI | OPTIMAL+ | SUALAB | Preferred Networks | K

Camera/Sensor Vendors

BASLER | Allied Vision | COGNEX | ADLINK | Canon

Edge System Providers

Hewlett Packard Enterprise | Lenovo | Atos | DYNICS | ADLINK | NEOUSYS TECHNOLOGY

Cloud Providers
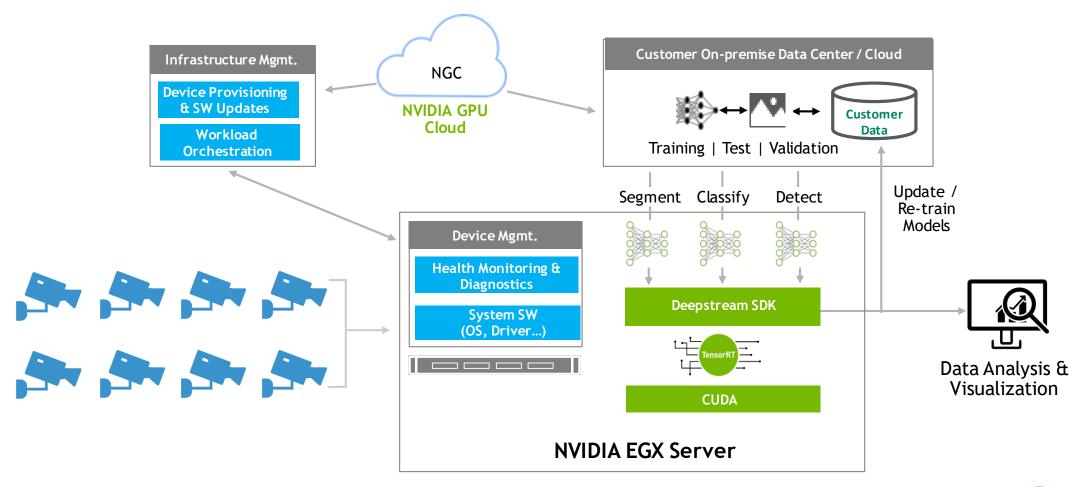
Google Cloud | aws | Azure

INSPECTION DEPLOYMENT – DEEPSTREAM

Infrastructure Mgmt.
- Device Provisioning & SW Updates
- Workload Orchestration

NGC
NVIDIA GPU Cloud

Customer On-premise Data Center / Cloud
Customer Data
Training | Test | Validation

Update / Re-train Models

Segment   Classify   Detect

Device Mgmt.
- Health Monitoring & Diagnostics
- System SW (OS, Driver…)

Deepstream SDK
TensorRT
CUDA

NVIDIA EGX Server

Data Analysis & Visualization

PREDICTIVE
MAINTENANCE

PREDICTIVE MAINTENANCE OVERVIEW

Ensuring Operational Continuity and Equipment Utilization

What

- Predictive Maintenance enables operators to proactively manage equipment based on condition-based digital twins using AI, rather than reacting to unplanned catastrophic equipment failure or costly scheduled maintenance.
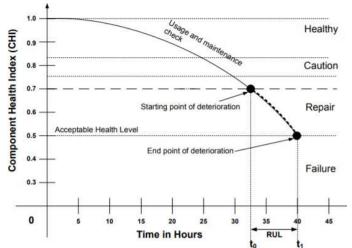
Why

- Reduces total downtime & eliminates unplanned downtime

- Reduces total maintenance costs

- Extends operational life of capital equipment

- Improves efficiency, quality, and safety

PREDICTIVE MAINTENANCE WORKLOADS

Anomaly Detection & Classification
Timely Detection of Rare Events to Avoid Downtime

Usage Based Lifing
Estimating Remaining Useful Life of parts, systems or processes

Work Scope Optimization
Prescribing Workplan to Minimize Downtime and Asset Optimization

Digital Twin

REMAINING USEFUL LIFE PREDICTION

Reliably predicting the remaining life of mechanical equipment avoids unscheduled maintenance and extends equipment utility.
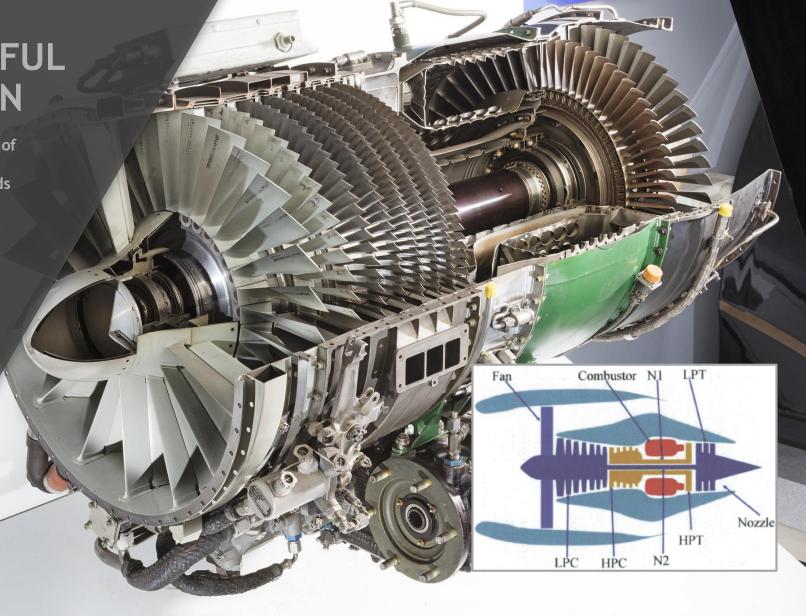
The health of an engine fleet can be modeled using data from 21 engine sensors (temperature, pressure, rpm, etc.).

State of the art deep learning models are proving capable of predicting the remaining useful life with 35-49% better accuracy than traditional methods.
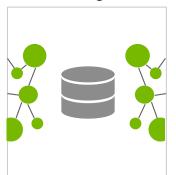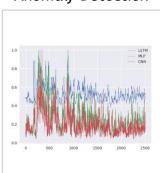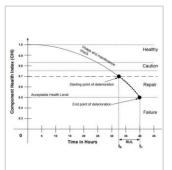

NASA engine dataset: Turbofan Engine Degradation Simulation Data Set https://ti.arc.nasa.gov/tech/dash/groups/pcoe/prognostic-data-repository/

NVIDIA PLATFORM FOR PREDICTIVE MAINTENANCE

Data Management	Anomaly Detection	Predicting Failures	Time Series Search	Work scope Opt.	Digital Twin
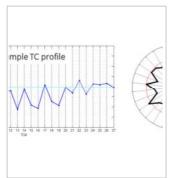
Partner AI Platform

C3.ai   CONUNDRUM   sparkcognition™   iguazio   Reliability Solutions. The Art of Prediction

Edge Inference SDKs

On-Premise / Cloud Training SDKs

Inference GPUs

Jetson   T4

Training GPUs

Tesla   DGX   Data Center   aws   Azure   Google Cloud   Cloud

NVIDIA ADVANTAGE

MOST ADOPTED PLATFORM FOR ACCELERATING AI
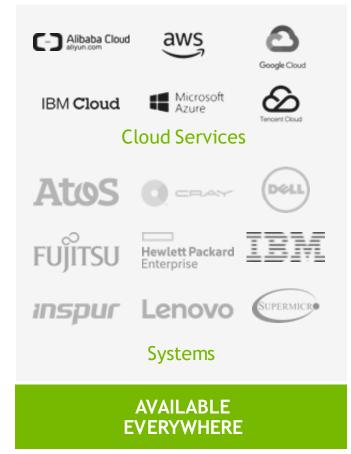
8 MLPerf 0.6 Training Records

MLPerf

	Benchmark	Record
At Scale Record	Object Detection (Heavy Weight) Mask R-CNN	18.47 Mins
	Translation (Recurrent) GNMT	1.8 Mins
	Reinforcement Learning (MiniGo)	13.57 Mins
Per Accelerator Record	Object Detection (Heavy Weight) Mask R-CNN	25.39 Hrs
	Object Detection (Light Weight) SSD	3.04 Hrs
	Translation (Recurrent) GNMT	2.63 Hrs
	Translation (Non-recurrent) Transformer	2.61 Hrs
	Reinforcement Learning (MiniGo)	3.65 Hrs

RECORD-SETTING PERFORAMNCE

Training   Inference

Device

Chainer   TensorRT   AWS SageMaker

mxnet   ONNX   GCP ML Engine

PYTORCH   python   AzureML

TensorFlow   RAPIDS

END-TO-END SOFTWARE STACK

Alibaba Cloud   aws   Google Cloud

IBM Cloud   Microsoft Azure   Tencent Cloud

Cloud Services

Atos   CRAY   DELL

FUJITSU   Hewlett Packard Enterprise   IBM

inspur   Lenovo   SUPERMICRO

Systems

AVAILABLE EVERYWHERE

NVIDIA

NEXT STEPS

RESOURCES

Industrial AI Content

NVIDIA Deep Learning Institute
www.nvidia.com/en-us/deep-learning-ai/education

NGC
www.nvidia.com/en-us/gpu-cloud

DLI TRAINING FOR MANUFACTURING

▸ **New to deep learning, accelerated data science, or accelerated computing?** Your team will get hands-on training and attain practical skills to solve real-world problems, including how to build neural networks and how to accelerate applications with CUDA.

▸ **Have some experience with deep learning?** Your team can apply their fundamental knowledge to industry-specific training.

▸ Reach out to nvdli@nvidia.com for consultation and to discuss further training options recommended for Manufacturing.

→ Fundamentals of Deep Learning for Multi-GPUs

→ Fundamentals of Deep Learning for Multiple Data Types

→ Deep Learning for Industrial Inspection

→ Deep Learning for Intelligent Video Analytics

→ Deep Learning for Robotics

→ Applications of AI for Predictive Maintenance

→ Applications of AI for Anomaly Detection